## REMARKS

The application has been reviewed in light of the Non-Final Office Action mailed August 4, 2005. At the time of the Non-Final Office Action, claims 1-24 were pending in this application.

Claims 1- 24 stand rejected in view of prior art. For the reasons discussed below, Applicants believe that all of the remaining claims are patentable over the cited prior art, and therefore respectfully traverse Examiner's rejection.

### I. Rejection under 35 U.S.C. § 103(a)

Claims 1-24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over either U.S. Patent 6,510,947 issued to Schulte *et al.* [hereinafter *Schulte*] or U.S. Patent Publication 2003/0132141 issued to Adams *et al.* [hereinafter *Adams*] in the alternative in view of U.S. Patent 5,842,522 issued to Echols *et al.* [hereinafter *Echols*].

#### A. The Cited References Do Not Teach All Claim Limitations of Applicants' Claims

A prima facie case of obviousness requires a showing that all claim limitations be taught or suggested by the art. M.P.E.P. § 2143.03. Applicants respectfully submit the combination of *Schulte*, *Adams*, and *Echols* fail to yield a process within the scope of the claims. *Schulte*, *Adams*, and *Echols* fail to form a proper basis for a prima facie case of obviousness, because they fail to teach all of the limitations of the claimed invention.

In particular, as to independent claims 1, 11, and 18, the cited references fail to teach or suggest a shale shaker screen or vibrating screen that is "formed of the same screen used to form the downhole sand control screen" where such screen is "formed of a plurality of layers of screens that have been diffusion-bonded together." Accordingly, the cited references cannot form a proper basis for a prima facie case of obviousness.

The Examiner notes that the screen metallurgy of *Echols* can be the same metallurgy as that of *Schulte* and *Adams* as follows:

> It is noted that since the screen material of Echols et al. the screen material of Schulte et al. and Adams et al. is formed of the same type of screen material used to form the sand control screen as recited.

*See Office Action* at 3. Applicants recognize that the type of metal used in *Echols* may also be used in some embodiments of the shale shakers in *Schulte* and *Adams*. The type of metal used, however, is only one aspect of the screen. Another aspect of the "downhole control screen" is that it is comprised of "a plurality of layers of screens." Nowhere in any of the cited references do the references teach that the screen used in the "shale shaker screen" of independent claims 1 and 11 or that the "vibrating screen" of independent claim 11 should be formed of the same screen as in the "downhole control screen" where the "downhole control screen" is "formed of a plurality of layers of screens."

In other words, merely showing that the type of metallurgy used may coincide in certain embodiments of the screens of the cited references is not sufficient in itself to form an appropriate basis for an obviousness rejection. Each and every limitation of the claims must be taught or suggested by the prior art to form a proper basis for an obviousness rejection. M.P.E.P. § 2143.03. In this case, the cited references fail to show that the "shale shaker screen" of independent claims 1 and 11 or that the "vibrating screen" of independent claim 11 should be formed of the same screen as used in a "downhole control screen" where the "downhole control screen" is "formed of a plurality of layers of screens."

Accordingly, the cited references fail to make obvious Applicants' claims. As such, Applicants respectfully request withdrawal of the 35 U.S.C. § 103(a) rejection as to independent claims 1, 11, and 18 and correspondingly, dependent claims thereof, 2-10, 12-17, and 19-24.

Furthermore, as to independent claims 1, 11, and 18, the cited references fail to teach "a downhole sand control screen formed of a plurality of layers of screens *that have been diffusion-bonded together*" (emphasis added). Accordingly, the cited references cannot form a proper basis for a prima facie case of obviousness.

Applicants recognize that one or more of the cited references teaches sintering screen layers together. Applicants respectfully submit, however, that the term "sintering" describes a process that is different from "diffusion bonding." As shown by a dictionary, sintering means "forming a coherent bonded mass by heating metal powders without melting," whereas diffusion bonding refers to "a . . . process for joining metals by using only heat and pressure to achieve atomic bonding." *See e.g.*, MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS 604, 1492 (6th ed. 2003) (courtesy copy enclosed). The disclosure of the present application illustrates that the term diffusion bonding refers to the joining of metals by the use of both heat and pressure. *See Present Application*, para. 33 at 12 (showing an example in which the screens are joined by using pressures of "approximately 100 - 500 lbs" with heat that results in temperatures of "approximately 2200°F."). Thus, the term "sintering," which is a process that involves the application of only heat without pressure is not the same as the process of "diffusion-bonding," which involves the application of both heat and pressure. Accordingly, a disclosure of "sintering" does not amount to a teaching or suggestion of "diffusion-bonding."

Therefore, none of the cited references alone or in combination teach or suggest each and every element of all of the pending claims, namely a shale shaker or vibrating screen "formed of the same screen used to form the downhole sand control screen" and where such screen is "formed of a plurality of layers of screens that have been diffusion-bonded together." (emphasis added) As such, the rejections of independent claims 1, 11, and 18 and corresponding

dependent claims 2-10, 12-17, and 19-24 under 35 U.S.C. § 103(a) are unsupported and therefore should be withdrawn.

**B. No Motivation to Combine the Cited References Exist in the Cited References**

A prima facie case of obviousness requires a suggestion or motivation in the prior art references to make the specific combination of elements claimed by Applicants. M.P.E.P. § 2143.01 (citing *In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998) (The combination of the references taught every element of the claimed invention, however without a motivation to combine, a rejection based on a prima facie case of obvious was held *improper.*); *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308 (Fed. Cir. 1999) (The level of skill in the art cannot be relied upon to provide the suggestion to combine references.)). The cited prior art references contain no such motivation or suggestion to combine the elements of *Schulte*, *Adams*, and *Echols* to arrive at the specific combination of elements claimed by Applicants.

The Examiner writes, in part, as follows:

> It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a sand control screen as taught by Echols et al. in the wellbore of Schulte et al. or Adams et al. when the well is placed in production to prevent the production of sand as taught by Echols et al. (*See* col. 1, lines 13-29).
>
> Alternatively, it would also have been obvious to use a shale shaker screen as taught by Schulte et al. or Adams et al. during the drilling operation to drill the wellbore of Echols et al. in order to remove solids from the drilling mud to minimize wear on mud pumps and other mechanical equipment used for drilling (*See* col. 1, lines 35-55 in Schulte et al. and paragraph [0011] in Adams et al.).

*See Office Action* at 2-3. Applicants respectfully submit that the Examiner has not pointed to any suggestion or motivation to combine the teachings of *Schulte*, *Adams*, and *Echols* that is present in the cited references themselves. The Examiner has provided no evidence or finding of the specific understanding or principle within the knowledge of a person of ordinary skill in the art at

the time of the invention that would have supplied the motivation to combine the cited references. *See* M.P.E.P. § 2143.01.

Further, as provided in M.P.E.P. § 2144.03(C), a conclusion as to the supposed action of a person of ordinary skill in the art is insufficient to establish a prima facie case of obviousness. To the extent that Examiner relies on such a statement or statements to supply the necessary motivation to combine or modify the prior art references, Applicants hereby respectfully traverse the lack of such a showing and request under M.P.E.P. § 2144.03(C) that the Examiner supply an affidavit or other documentary proof establishing the prior art knowledge that would have motivated a person of ordinary skill in the art to make the specific modification and/or combination of elements to arrive at Applicants' invention.

Additionally, Applicants respectfully point out that the Federal Circuit has made clear that "[t]he mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." M.P.E.P. § 2143.01 (citing *In re Mills*, 916 F.2d 680,682 (Fed. Cir. 1990)). The M.P.E.P. also makes clear the requirement that the Examiner provide objective reasons to combine the references apart from naked statements that "it would be obvious to a person of ordinary skill." M.P.E.P. § 2143.01 (explaining that "A statement that modifications of the prior art to meet the claimed invention would have been 'well within the ordinary skill of the art at the time the claimed invention was made' because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references." (citations omitted)).

Thus, Applicants respectfully submit that it is inappropriate to combine *Schulte*, *Adams*, and *Echols*. Further, the references contain no suggestion or motivation to combine or to

modify the references to arrive at the specific combination of elements of the present invention. Thus, Applicants respectfully request the removal of the 35 U.S.C. § 103(a) rejection as to the independent claims 1, 11, and 18, and correspondingly, dependent claims 2-10, 12-17, and 19-24.

## SUMMARY

In light of the above amendments and remarks, Applicants respectfully submit that the application is now in condition for allowance and early notice of the same is earnestly solicited. Should the Examiner have any questions, comments or suggestions in furtherance of the prosecution of this application, the Examiner is invited to contact the attorney of record by telephone, facsimile or electronic mail, as indicated below.

Applicants believes that no fees are due in association with the filing of this Response. However, should the Commissioner deem that any fees are due, including any fees for any extensions of time, Applicants respectfully request that the Commissioner accept this as a Petition therefore, and directs that any fees be debited from Baker Botts L.L.P., Deposit Account No. 02-0383, *(formerly Baker & Botts, L.L.P.,)* Order Number 063718.0303.

Respectfully submitted,

BAKER BOTTS L.L.P.

Date: October 11, 2005

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# McGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS

## Sixth Edition



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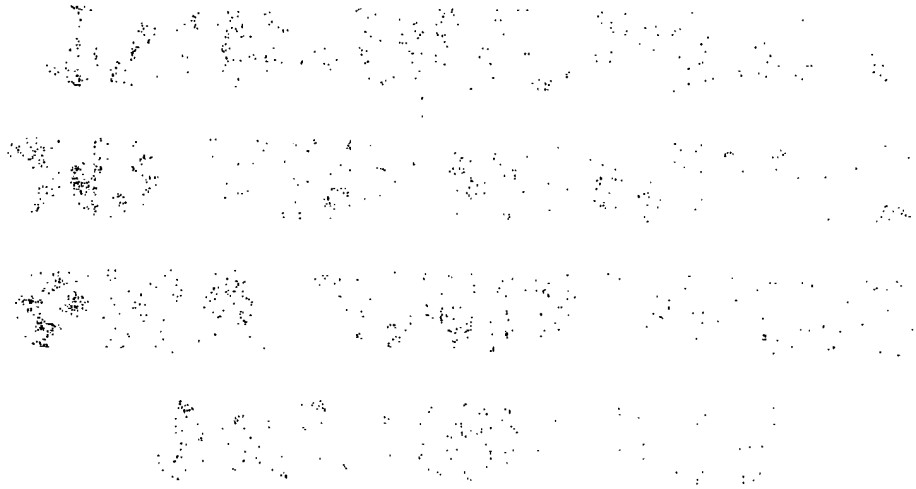
**On the cover: Representation of a fullerene molecule with a noble gas atom trapped inside. At the Permian-Triassic sedimentary boundary the noble gases helium and argon have been found trapped inside fullerenes. They exhibit isotope ratios quite similar to those found in meterorites, suggesting that a fireball meteorite or asteroid exploded when it hit the Earth, causing major changes in the environment. *(Image copyright © Dr. Luann Becker. Reproduced with permission.)***



Over the six editions of the Dictionary, material has been drawn from the following references: G. M. Garrity et al., *Taxonomic Outline of the Procaryotes,* Release 2, Springer-Verlag, January 2002; D. W. Linzey, *Vertebrate Biology,* McGraw-Hill, 2001; J. A. Pechenik, *Biology of the Invertebrates,* 4th ed., McGraw-Hill, 2000; *U.S. Air Force Glossary of Standardized Terms,* AF Manual 11-1, vol. 1, 1972; F. Casey, ed., *Compilation of Terms in Information Sciences Technology,* Federal Council for Science and Technology, 1970; *Communications-Electronics Terminology,* AF Manual 11-1, vol. 3, 1970; P. W. Thrush, comp. and ed., *A Dictionary of Mining, Mineral, and Related Terms,* Bureau of Mines, 1968; *A DOD Glossary of Mapping, Charting and Geodetic Terms,* Department of Defense, 1967; J. M. Gilliland, *Solar-Terrestrial Physics: A Glossary of Terms and Abbreviations,* Royal Aircraft Establishment Technical Report 67158, 1967; W. H. Allen, ed., *Dictionary of Technical Terms for Aerospace Use,* National Aeronautics and Space Administration, 1965; *Glossary of Stinfo Terminology,* Office of Aerospace Research, U.S. Air Force, 1963; *Naval Dictionary of Electronic, Technical, and Imperative Terms,* Bureau of Naval Personnel, 1962; R. E. Huschke, *Glossary of Meteorology,* American Meteorological Society, 1959; *ADP Glossary,* Department of the Navy, NAVSO P-3097; *Glossary of Air Traffic Control Terms,* Federal Aviation Agency; *A Glossary of Range Terminology, White Sands Missile Range, New Mexico,* National Bureau of Standards, AD 467-424; *Nuclear Terms: A Glossary,* 2d ed., Atomic Energy Commission.

**McGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS, Sixth Edition**



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**diffusion barrier** [CHEM ENG] Porous barrier through which gaseous mixtures are passed for enrichment of the lighter-molecular-weight constituent of the diffusate; used as a many-stage cascade system for the recovery of $^{235}UF_6$ isotopes from a $^{238}UF_6$ stream. { də'fyü·zhən ˌbar·ē·ər }

**diffusion bonding** [MET] A solid-state process for joining metals by using only heat and pressure to achieve atomic bonding. { də'fyü·zhən ˌbänd·iŋ }

**diffusion brazing** [MET] A process which produces bonding of the faying surfaces by heating them to suitable temperatures; the filler metal is diffused with the base metal and approaches the properties of the base metal. Also known as transient liquid phase-bonding. { də'fyü·zhən ˌbrāz·iŋ }

**diffusion capacitance** [ELECTR] The rate of change of stored minority-carrier charge with the voltage across a semiconductor junction. { də'fyü·zhən kə'pas·əd·əns }

**diffusion cloud chamber** [NUCLEO] A cloud chamber in which vapor diffuses from a source near a hot plate and condenses on a cold plate; the resulting layer of supersaturated vapor between the plates is sensitive to the passage of ionizing particles. { də'fyü·zhən 'klaůd ˌchām·bər }

**diffusion coating** [MET] An alloy coating produced by allowing the coating material to diffuse into the base at high temperature. { də'fyü·zhən ˌkōd·iŋ }

**diffusion coefficient** [PHYS] The weight of a material, in grams, diffusing across an area of 1 square centimeter in 1 second in a unit concentration gradient. Also known as diffusivity. { də'fyü·zhən ˌkō·i'fish·ənt }

**diffusion constant** [SOLID STATE] The diffusion current density in a hologeneous semiconductor divided by the charge carrier concentration gradient. { də'fyü·zhən ˌkän·stənt }

**diffusion current** [ANALY CHEM] In polarography with a dropping-mercury electrode, the flow that is controled by the rate of diffusion of the active solution species across the concentration gradient produced by the removal of ions or molecule at the electrode surface. { də'fyü·zhən ˌkər·ənt }

**diffusion diagram** [METEOROL] A diagram for displaying the comparative properties of various diffusion processes, with coordinates of the mean free path or mixing length and mean molecular speed or diffusion velocity, for molecular or eddy diffusion, respectively; each point of the diagram determines diffusivity. { də'fyü·zhən ˌdī·ə,gram }

**diffusion diameter** [STAT MECH] For a gas, the diameter of identical hard spheres that display the same diffusion as that observed for the molecules of the actual gas when their motion is treated classically. { di'fyü·zhən dīˌam·əd·ər }

**diffusion disk** [OPTICS] A piece of transparent material that is marked or embossed, and is used with a camera lens to give the image a hazy softened quality. Also known as diffusing disk. { də'fyü·zhən ˌdisk }

**diffusion equation** [PHYS] **1.** An equation for diffusion which states that the rate of change of the density of the diffusing substance, at a fixed point in space, equals the sum of the diffusion coefficient times the Laplacian of the density, the amount of the quantity generated per unit volume per unit time, and the negative of the quantity absorbed per unit volume per unit time. **2.** More generally, any equation which states that the rate of change of some quantity, at a fixed point in space, equals a positive constant times the Laplacian of that quantity. { də'fyü·zhən i'kwā·zhən }

**diffusion extraction** [FOOD ENG] Extraction of juice by countercurrent flow of hot water through fruit slices. { də'fyü·zhən ik,strak·shən }

**diffusion flame** [CHEM] A long gas flame that radiates uniformly over its length and precipitates free carbon uniformly. { də'fyü·zhən ˌflām }

**diffusion gradient** [PHYS] The graphed distance of penetration (diffusion) versus concentration of the material (or effect) diffusing through a second material; applies to heat, liquids, solids, or gases. { də'fyü·zhən ˌgrād·ē·ənt }

**diffusion hygrometer** [ENG] A hygrometer based upon the diffusion of water vapor through a porous membrane; essentially, it consists of a closed chamber having porous walls and containing a hygroscopic compound, whose absorption of water vapor causes a pressure drop within the chamber that is measured by a manometer. { də'fyü·zhən hī'gräm·əd·ər }

**diffusion kernel** [NUCLEO] The neutron flux resulting from a point source emitting one neutron per second; it is a function of the distance between the source and the point where th is measured. { də'fyü·zhən ˌkər·nəl }

**diffusion length** [PHYS] The average distance travele particle, such as a minority carrier in a semiconducto thermal neutron in a nuclear reactor, from the point at it is formed to the point at which it is absorbed. { d zhən ˌleŋkth }

**diffusion-limited aggregation** [PHYS] A mathem model for particle aggregation processes, such as the g of a metal deposit on an electrochemical cell, in which pa move according to a random walk process until they ar a certain fixed distance from the current aggregate, when stick to it. { də'fyü·zhən ˈlim·əd·əd ag·rə'gā·shən }

**diffusion-limited current density** [MET] The densit responding to the maximum transfer rate that a materi sustain due to diffusion limits. { dəˈfyü·zhən ˈlim·əd·ad ənt ˌden·səd·ē }

**diffusion number** [FL MECH] A dimensionless numbe in the study of mass transfer, equal to the diffusivity of a through a stationary solution contained in the solid, ti characteristic time, divided by the square of the distance the midpoint of the solid to the surface. Symboliz { də'fyü·zhən ˌnəm·bər }

**diffusion plant** [NUCLEO] A plant which separates is by isotopic diffusion or thermal diffusion. { də'fyü ˌplant }

**diffusion potential** [PHYS CHEM] A potential diff across the boundary between electrolytic solutions with ent compositions. Also known as liquid junction pot { də'fyü·zhən pə,ten·chəl }

**diffusion pump** [ENG] A vacuum pump in which a s of heavy molecules, such as mercury vapor, carries gas cules out of the volume being evacuated; also used for se ing isotopes according to weight, the lighter molecules pumped preferentially by the vapor stream. { də'fyü ˌpəmp }

**diffusion respiration** [PHYSIO] Exchange of gases th the cell membrane, between the cells of unicellular or simple organisms and the environment. { də'fyü·zhə pə'rā·shən }

**diffusion theory** [ELEC] The theory that in semicondi where there is a variation of carrier concentration, a mot the carriers is produced by diffusion in addition to th determined by the mobility and the electric field. { d zhən ˌthē·ə·rē }

**diffusion-transfer process** [GRAPHICS] Any of s photographic processes for copying documents in whi copy is produced by developing a photographic image, tra ring by diffusion the silver salts in undeveloped areas receiving paper, and developing the transferred i { dəˈfyü·zhən 'tranz·fər ˌprä·səs }

**diffusion transistor** [ELECTR] A transistor in which c flow is a result of diffusion of carriers, donors, or acc as in a junction transistor. { dəˈfyü·zhən tranˌzis·tər }

**diffusion velocity** [FL MECH] **1.** The relative mean m lar velocity of a selected gas undergoing diffusion in a g atmosphere, commonly taken as a nitrogen ($N_2$) atmos a molecular phenomenon that depends upon the gaseou centration as well as upon the pressure and temperature ents present. **2.** The velocity or speed with which a tur diffusion process proceeds as evidenced by the motion o vidual eddies. { dəˈfyü·zhən və'läs·əd·ē }

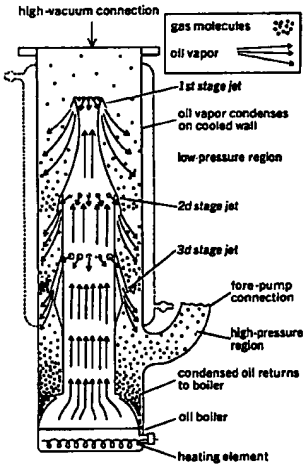
**diffusion welding** [MET] A welding process which u high temperatures and pressures to coalesce the faying su by solid-state bonding; there is no physical movement, deformation of the parts involved, or melting. { dəˈfyü ˌweld·iŋ }

**diffusiophoresis** [CHEM ENG] A process in a sc whereby water vapor moving toward the cold water s carries particulates with it. { dəˌfyü·zē·ō·fə'rē·səs }

**diffusive equilibrium** [METEOROL] The steady resulting from the diffusion process, primarily of interest external forces and sources and sinks exist within the fi such a state the constituent gases of the atmosphere wo distributed independently of each other, the heavier decr more rapidly with height than the lighter; but the prese turbulent mixing precludes establishment of complete dif equilibrium. { dəˈfyü·ziv ˌē·kwə'lib·rē·əm }

**diffusivity** [PHYS] *See* diffusion coefficient. [TH

**DIFFUSION PUMP**




Main operating features of diffusion pump.

as singular point of a function. [METEOROL] A characteristic meteorological condition which tends to occur on or near a specific calendar date more frequently than chance would indicate; an example is the January thaw. [RELAT] A region of space-time where one or more components of the Riemann curvature tensor becomes infinite. { ˌsiŋ·gyə'lar·əd·ē }

**singularity theorems** [RELAT] Theorems proving that singularities must develop in certain space-times, such as the universe, given only broad conditions, such as causality, and the existence of a trapped surface. { ˌsiŋ·gyə'lar·əd·ē ˌthir·əmz }

**singular matrix** [MATH] A matrix which has no inverse; equivalently, its determinant is zero. { 'siŋ·gyə·lər ˌmā·triks }

**singular point** [MATH] 1. For a differential equation, a point that is a singularity for at least one of the known functions appearing in the equation. 2. A point on a curve at which the curve possesses no smoothly turning tangent, or crosses or touches itself, or has a cusp or isolated point. 3. A point on a surface whose coordinates, $x$, $y$, and $z$, depend on the parameters $u$ and $v$, at which the Jacobians $D(x,y)/D(u,v)$, $D(y,z)/D(u,v)$, and $D(z,x)/D(u,v)$ all vanish. 4. *See* singularity. { 'siŋ·gyə·lər 'pȯint }

**singular solution** [MATH] For a differential equation, a solution that is not generic, that is, not obtainable from the general solution. Also known as singular integral. { 'siŋ·gyə·lər sə'lü·shən }

**singular transformation** [MATH] A linear transformation which has no corresponding inverse transformation. { 'siŋ·gyə·lər tranz·fər'mā·shən }

**singular values** [MATH] For a matrix $A$ these are the positive square roots of the eigenvalues of $A^*A$, where $A^*$ denotes the adjoint matrix of $A$. { 'siŋ·gyə·lər 'val·yüz }

**singultus** [MED] A repeated involuntary spasmodic contraction of the diaphragm followed by sudden closures of the glottis. Also known as hiccup. { 'siŋˌgəl·təs }

**sinh** *See* hyperbolic sine. { 'sīn'āch }

**sinhalite** [MINERAL] $MgAl(BO_4)$ A mineral composed of magnesium aluminum borate; sometimes used as a gem. { 'sin·əˌlīt }

**sinistral fault** *See* left lateral fault. { 'sin·əs·trəl 'fȯlt }

**sinistral fold** [GEOL] An asymmetric fold whose long limb, when viewed along its dip, appears to have a leftward offset. { ˌsin·əs·trəl 'fōld }

**sinistrorse** [BIOL] Twisting or coiling counterclockwise. { ˌsin·ə'strȯrs }

**sinistrorse curve** *See* left-handed curve. { ˌsin·ə'strȯrs 'kərv }

**sinistrorsum** *See* left-handed curve. { ˌsin·ə'strȯrs·əm }

**sink** [COMMUN] Equipment at the end of a communications channel that receives signals and may perform other functions such as error detection. [ELECTROMAG] The region of a Rieke diagram where the rate of change of frequency with respect to phase of the reflection coefficient is maximum for an oscillator; operation in this region may lead to unsatisfactory performance by reason of cessation or instability of oscillations. [GEOL] 1. A circular or ellipsoidal depression formed by collapse on the flank of or near to a volcano. 2. A slight, low-lying desert depression containing a central playa or saline lake with no outlet, as where a desert stream comes to an end or disappears by evaporation. [MIN ENG] 1. To excavate strata downward in a vertical line for the purpose of winning and working minerals. 2. To drill or put down a shaft or borehole. [PHYS] A device or system where some extensive entity is absorbed, such as a heat sink, a sink flow, a load in an electrical circuit, or a region in a nuclear reactor where neutrons are strongly absorbed. { siŋk }

**sinker** [MIN ENG] 1. A person who sinks mine shafts and puts in framing. 2. A special movable pump used in shaft sinking. 3. *See* sinker drill. { 'siŋ·kər }

**sinker bar** [MIN ENG] A short, heavy rod placed above the drill jars to increase the effect of the upward sliding jars in well-drilling with cable tools. { 'siŋ·kər ˌbär }

**sinker drill** [MIN ENG] A jackhammer type of rock drill used in shaft sinkings. Also known as sinker. { 'siŋ·kər ˌdril }

**sink-float separation process** [ENG] A simple gravity process used in ore dressing that separates particles of different sizes or composition on the basis of differences in specific gravity. { 'siŋk 'flōt ˌsep·ə'rā·shən ˌprä·səs }

**sink flow** [FL MECH] 1. In three-dimensional flow, a point into which fluid flows uniformly from all directions. 2. In two-dimensional flow, a straight line into which fluid flows uniformly from all directions at right angles to the line. { 'siŋk ˌflō }

**sinkhead** *See* feedhead. { 'siŋkˌhed }

**sinkhole** [GEOL] Closed surface depressions in regions of karst topography produced by solution of surface limestone or the collapse of cavern roofs. { 'siŋkˌhōl }

**sinkhole plain** [GEOL] A regionally extensive plain or plateau characterized by well-developed karst features. { 'siŋk ˌhōl ˌplān }

**sinking** [OCEANOGR] The downward movement of surface water generally caused by converging currents or when a water mass becomes denser than the surrounding water. Also known as downwelling. [OPTICS] In atmospheric optics, a refraction phenomenon, the opposite of looming, in which an object on, or slightly above, the geographic horizon apparently sinks below it. { 'siŋk·iŋ }

**sinking-and-walling scaffold** [MIN ENG] A platform designed for use in shaft sinking to enable sinking and walling to be performed simultaneously. Also known as Galloway sinking and walling stage. { 'siŋk·iŋ ən ˌwȯl·iŋ 'skaˌfōld }

**sinking bucket** *See* hoppit. { 'siŋk·iŋ ˌbək·ət }

**sinking fund** [IND ENG] A fund established by periodically depositing funds at compound interest in order to accumulate a given sum at a given future time for some specific purpose. { 'siŋk·iŋ ˌfənd }

**sinking pump** [MIN ENG] A long, narrow, electrically driven centrifugal-type pump designed for keeping a shaft dry during sinking operations. { 'siŋk·iŋ ˌpəmp }

**sinking tubing** [MET] Drawing tubing through a die or passing it through rolls without the use of a tool in the bore to control the inside diameter. { 'siŋk·iŋ ˌtüb·iŋ }

**sink mark** [ENG] A shallow depression or dimple on the surface of an injection-molded plastic part due to collapsing of the surface following local internal shrinkage after the gate seals. { 'siŋk ˌmärk }

**sinoatrial node** [ANAT] A bundle of Purkinje fibers located near the junction of the superior vena cava with the right atrium which acts as a pacemaker for cardiac excitation. Abbreviated SA node. Also known as sinoauricular node. { ˌsī·nō'ā·trē·əl 'nōd }

**sinoauricular node** *See* sinoatrial node. { ˌsī·nō·ȯ'rik·yə·lər 'nōd }

**sinoite** [MINERAL] $Si_2N_2O$ A nitride mineral known only in meteorites. { 'sīn·əˌwīt }

**Sinope** [ASTRON] A small satellite of Jupiter with a diameter of about 17 miles (27 kilometers), orbiting with retrograde motion at a mean distance of about $1.47 \times 10^7$ miles ($2.37 \times 10^7$ kilometers). Also known as Jupiter IX. { 'sin·ə·pē }

**sinopie** [MINERAL] A blood-red or brownish-red (with a tinge of yellow) variety of quartz containing inclusions of hematite. { 'sin·ə·pəl }

**sinter** [MET] 1. The product of a sintering operation. 2. A shaped body composed of metal powders and produced by sintering with or without previous compacting. [MINERAL] *See* siliceous sinter. [PETR] A chemical sedimentary rock deposited by precipitation from mineral waters, especially siliceous sinter and calcareous sinter. { 'sin·tər }

**sintered copper** [MET] Copper prepared by heating a compressed powder of the metal to form a solid mass. { 'sin·tərd 'käp·ər }

**sintered steel** [MET] Steel prepared by heating compressed iron powder and graphite to form a solid. { 'sin·tərd 'stēl }

**sintering** [MET] Forming a coherent bonded mass by heating metal powders without melting; used mostly in powder metallurgy. { 'sin·tə·riŋ }

**sintering furnace** [MET] A furnace in which presintering and sintering operations are carried out. { 'sin·tə·riŋ ˌfər·nəs }

**sinter setting** *See* mechanical setting. { 'sin·tər ˌsed·iŋ }

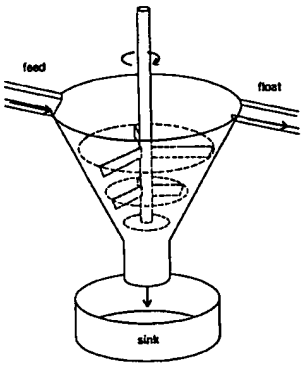
**sinuate** [BOT] Having a wavy margin with strong indentations. { 'sin·yəˌwāt }

**sinus** [BIOL] A cavity, recess, or depression in an organ, tissue, or other part of an animal body. { 'sī·nəs }

**sinus gland** [INV ZOO] An endocrine gland in higher crustaceans, lying in the eyestalk in most stalk-eyed species, which is the site of storage and release of a molt-inhibiting hormone. { 'sī·nəs ˌgland }

**sinus hairs** *See* vibrissae. { 'sī·nəs ˌherz }

**SINK-FLOAT SEPARATION PROCESS**




**Feed particles are introduced into suspension, whose specific gravity is between that of mineral and gangue particles; particles of higher specific gravity sink while those of lower specific gravity float; stirrer prevents suspension from setting out on the walls.**